NC RHRP

Findings Brief
NC Rural Health Research Program

July 2020

Changes in Care-Seeking after Rural Hospitals Merge

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OVERVIEW

Rural hospital mergers in the United States have increased significantly since 2010.[1] Enhanced financial performance and improved quality are often cited as benefits,[2] but hospital mergers can also lead to changes in the services provided by acquired (or "target") hospitals. After a merger, specific services provided by an acquired hospital could be: 1) augmented with visiting specialists, capital investment, or extended hours of operation, for example; OR 2) diminished by smaller budgets, relocation, or even closure of the service; OR 3) maintained at the pre-merger level.

Given the potentially less proximate access to services among rural residents, it is particularly important to understand any impact to the community caused by rural hospital mergers and acquisitions, so that policymakers and hospital executives can be adequately prepared to handle any challenges that arise. Therefore, **the purpose of this brief is to estimate the change in use of inpatient services delivered by acquired rural hospitals following a merger.**

METHODS

In this study, we defined a merger as an acquisition where ownership of a target (i.e., a rural hospital) is transferred to an acquirer (usually a larger hospital or system). To examine changes in care-seeking following a rural hospital merger, we first identified all rural hospitals that were acquired as part of a merger between the years 2014-2016. We defined rural hospitals as hospitals outside metropolitan Core Based Statistical Areas or within metropolitan areas and having a 2010 Rural-Urban Commuting Area (RUCA) code of 4 or greater.[3] Rural hospitals that experienced a merger were identified from "The Health Care Services Acquisition Report" by Irving Levin Associates for 2014-2016.[4] To identify the effective date of each merger, we verified merger dates for each reported rural merger through publicly available information online and, when necessary, phone calls to the hospital.

The Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) served as our primary source of hospital discharge data.[5] We used the SID, managed by the Agency for Healthcare Research and Quality (AHRQ), to provide discharge data for all payers. Data contain the admitting hospital, the patient's ZIP of residence, and other important characteristics (e.g., diagnosis, procedure, demographics). Not all SID provide information on hospital identifiers and patient residence ZIP codes, and the availability of this information is sometimes subject to yearly change. We restricted our analyses to merging hospitals in states that made information on hospital identifiers and patient residence ZIP codes available via the SID. Our final sample included 15 acquired hospitals with a daily net patient revenue range of $27,020 to $1,438,781. Study hospitals were located in Arizona, Iowa, Kentucky, Minnesota, New York, North Carolina, and Wisconsin.[6] We also considered the states of Colorado, Florida, Nebraska, New Jersey, Oregon, Rhode Island, Utah, Vermont, and Washington. However, these latter states did not

KEY FINDINGS

We examined 15 rural hospitals that were acquired as part of a merger between 2014 and 2016. Among these hospitals, our main finding was that the overall bypass rate for inpatient care showed little change between the 15 months prior to the merger and the 15 months following the merger (bypass was defined as any non-transfer inpatient discharge of a rural resident from a hospital *other than* the hospital located nearest to the centroid of the patient's ZIP-based residence). The overall bypass rate consistently ranged between 63-66%.

There is variation for specific conditions, however.

- Acquired rural hospitals were less likely to be bypassed for inpatient care pertaining to the respiratory system and mental diseases and disorders (e.g., psychoses).
- There is some evidence to suggest that changes in bypass rates following a merger are influenced by service profitability.

have any rural hospitals that (i) were acquired as part of a merger between the years 2014-2016 and (ii) provided sufficient pre- and post-merger data (i.e., at least six months of pre- and post-merger data). Additional data sources for our research included the Centers for Medicaid & Medicare Services Healthcare Cost Report Information System (HCRIS),[7] American Hospital Association (AHA) Annual Survey Database™,[8] Provider of Services data file,[9] StreetMap North America,[10] SAS dataset of zipcodes,[11] and core based statistical areas for 2015.[12]

After identifying rural acquired hospitals, we calculated trends in discharge rates of each acquired hospital over the months before and after merger. First, we identified the ZIPs for which the closest hospital was the merging rural hospital. Among all admissions from those ZIPs (regardless of destination), we defined three types of discharge rates:

- **Bypass** – any (non-transfer) inpatient discharge of a resident from a hospital *other than* the hospital located nearest to the centroid of the patient's ZIP-based residence. We reasoned that changes in the bypass rate in the months following a merger would indicate general shifts in patient care-seeking behavior and hospital service offerings.
- **Local** – any non-transfer inpatient discharge of a resident from the hospital located nearest to the centroid of the patient's ZIP-based residence.
- **Transfer** – a resident is first admitted as an inpatient to the hospital located nearest to the centroid of the patient's ZIP-based residence and is then transferred to a different hospital.

A visual depiction of bypass, local, and transfer discharges is provided in Figure 1.

Figure 1. Illustration of Bypass, Local, and Transfer Discharges

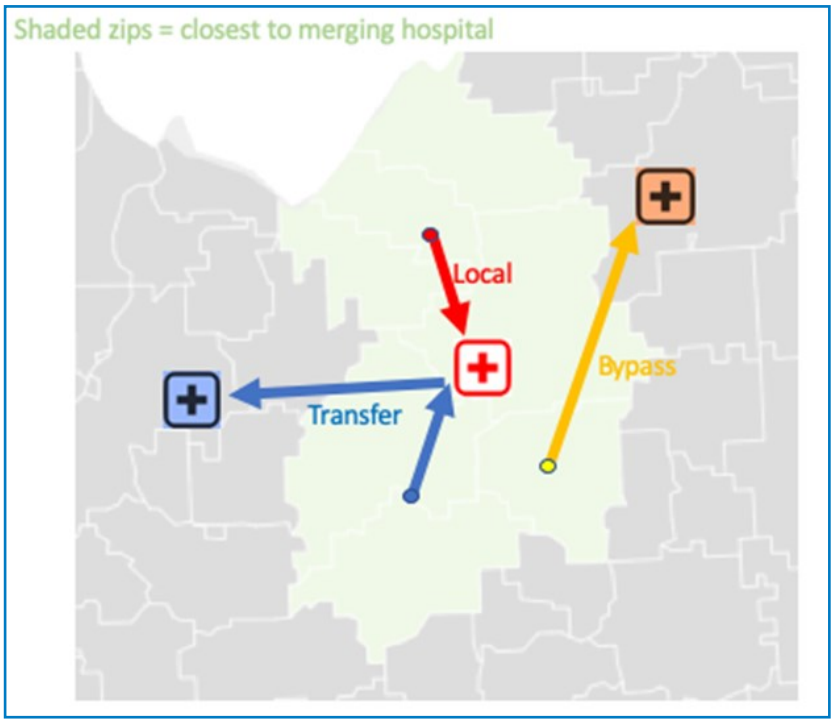


Figure 1: Illustration of Bypass, Local, and Transfer Discharges.Our analysis considers three types of discharges: bypass, local, and transfer discharges. Bypass is defined as any (non-transfer) inpatient discharge of a resident from a hospital *other than* the hospital located nearest to the centroid[13] of the patient's ZIP-based residence. Local discharges are defined as any non-transfer inpatient discharge of a resident from the hospital located nearest to the centroid of the patient's ZIP-based residence. Transfer discharges occur when a resident is first admitted as an inpatient to the hospital located nearest to the centroid of the patient's ZIP-based residence and is then transferred to a different hospital.

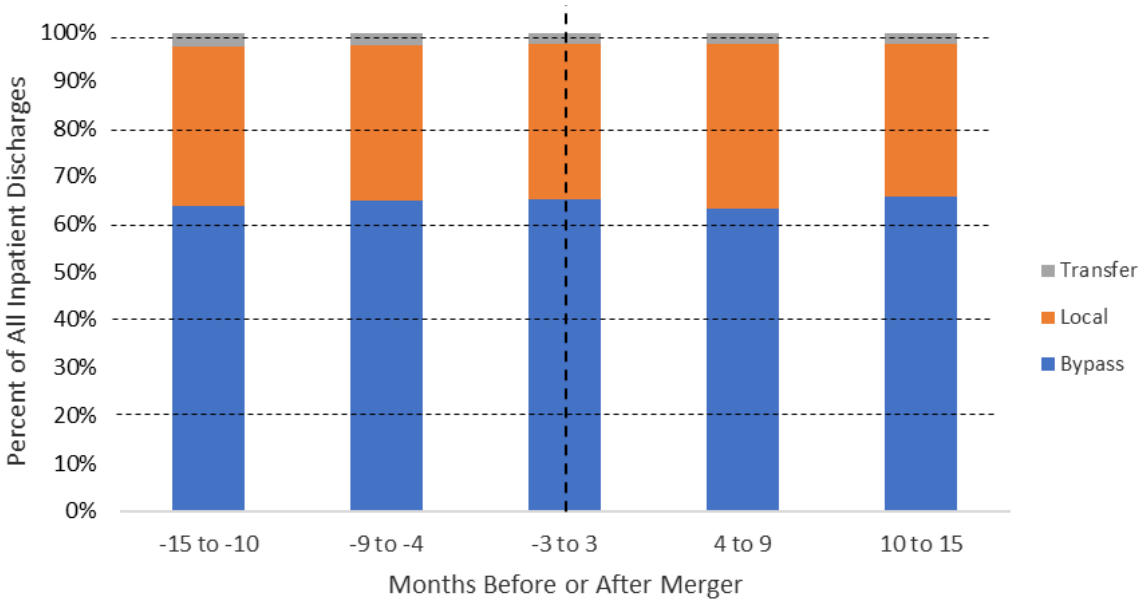
To calculate changes in bypass rate for the rural acquired hospitals, we selected for study all HCUP discharges for rural and urban residents whose closest hospital (based on residence ZIP) was one of the acquired hospitals. Next, we classified these discharges on the basis of the discharge date's proximity to the resident's closest hospital's merger completion date. Specifically, discharges were identified as belonging to one of the following categories: discharge occurred 15-10 months prior to the closest hospital's merger, nine to four months pre-merger, three months pre-merger to three months post-merger, four to nine months post-merger, or 10-15 months post-merger. We excluded inpatient discharges that occurred more than 15 months prior to or more than 15 months after the closest hospital's merger; many hospitals in our analysis sample did not have data more than 15 months pre-merger and more than 15 months post-

merger. Furthermore, we excluded discharges for patients whose state of residence did not match the state of the patient's closest hospital and admitting hospital (if different from the closest hospital). Next, we identified bypass, local, and transfer discharges and calculated bypass as a proportion of total discharges, stratified by temporal proximity to the respective merger completion date and major diagnostic category (MDC). For each MDC, we used Pearson's Chi-square test of independence to test whether the pre-merger bypass rate was equal to the post-merger bypass rate. Next, we repeated the above analysis with stratification by the ten most common diagnosis-related groups (DRG) rather than MDC. We initially considered a statistical significance threshold of p = .05. However, to correct for multiple testing, we applied a Bonferroni adjustment that accounted for the 64 statistical tests completed during our analysis.[14] Thus, we considered results with p-values less than .05/64=0.0008 to be statistically significant.

RESULTS

The final analysis sample included 98,934 inpatient discharges for residents whose closest hospital was acquired. Approximately 37.2% of discharges (n = 36,784) occurred four or more months before the resident's closest hospital's merger, 28.8% of discharges (n = 28,520) occurred within three months of the merger, and 34.0% of discharges (n = 33,630) occurred four or more months after the merger. Figure 2 shows the percent of all discharges that classified as transfer, local, and bypass, stratified by discharge date relative to the merger date of the patient's closest hospital. The overall bypass rate consistently ranged between 63-66%. Rates of transfer and local visits were consistent across the study period as well.

Figure 2. Change in Visit Type by Time Relative to Merger



Note: The vertical dashed line represents the month of the merger

Table 1 shows the percent of discharges classified as bypass, stratified by MDC and discharge date relative to the merger date of the patient's closest hospital. In general, bypass rates in the 15 months pre-merger were not statistically different than the bypass rates in the 15 months post-merger. One notable exception included results for MDC 4 (respiratory system). Results from Pearson's Chi-square test of independence show that the bypass rate for discharges corresponding to the respiratory system significantly decreased from pre-merger to post-merger.

Table 1. Percent Bypass by Major Diagnostic Category and Discharge Date Relative to Merger

		← Months Before or After Merger →					
MDC	**Description**	-15 to -10 (n = 14,385)	-9 to -4 (n = 22,399)	-3 to 3 (n = 28,520)	4 to 9 (n = 20,802)	10 to 15 (n = 12,828)	*p*[a]
1	Nervous system	76% (n = 694)	76% (n = 1,021)	73% (n = 1,353)	74% (n = 956)	78% (n = 576)	.71
3	Ear, nose, mouth, and throat	64% (n = 121)	67% (n = 204)	68% (n = 231)	71% (n = 175)	76% (n = 93)	.07
4	Respiratory system	51% (n = 1,657)	52% (n = 2,443)	49% (n = 3,003)	48% (n = 2,121)	48% (n = 1,168)	.0007
5	Circulatory system	64% (n = 1,823)	64% (n = 2,682)	66% (n = 3,426)	62% (n = 2,432)	66% (n = 1,455)	.61
6	Digestive system	58% (n = 1,277)	60% (n = 2,080)	61% (n = 2,478)	56% (n = 1,773)	58% (n = 1,132)	.05
7	Hepatobiliary system and pancreas	59% (n = 384)	62% (n = 635)	59% (n = 790)	56% (n = 593)	62% (n = 363)	.37
8	Musculoskeletal system	81% (n = 1,499)	82% (n = 2,433)	83% (n = 3,156)	81% (n = 2,276)	81% (n = 1,662)	.67
9	Skin, subcutaneous tissue, and breast	53% (n = 303)	56% (n = 552)	52% (n = 701)	51% (n = 458)	54% (n = 329)	.22
10	Endocrine	55% (n = 471)	56% (n = 797)	59% (n = 970)	58% (n = 761)	60% (n = 426)	.16
11	Kidney and urinary tract	63% (n = 638)	62% (n = 921)	57% (n = 1,200)	61% (n = 827)	54% (n = 513)	.03
13	Female reproductive system	72% (n = 160)	74% (n = 250)	73% (n = 327)	70% (n = 186)	78% (n = 98)	.93
14	Pregnancy, childbirth	63% (n = 1,685)	63% (n = 2,659)	63% (n = 3,378)	62% (n = 2,612)	65% (n = 1,607)	.95
15	Newborns and other neonates	64% (n = 1,661)	63% (n = 2,589)	64% (n = 3,329)	63% (n = 2,582)	66% (n = 1,609)	.65
16	Blood	59% (n = 149)	62% (n = 239)	63% (n = 338)	58% (n = 250)	65% (n = 103)	.95
17	Myeloproliferative diseases	76% (n = 111)	87% (n = 178)	89% (n = 219)	89% (n = 170)	90% (n = 94)	.02
18	Infectious and parasitic diseases	55% (n = 648)	60% (n = 1,072)	60% (n = 1,414)	58% (n = 1,117)	56% (n = 696)	.57
19	Mental diseases and disorders	89% (n = 460)	91% (n = 735)	88% (n = 1,055)	87% (n = 743)	89% (n = 462)	.08
20	Alcohol/drug use	78% (n = 112)	81% (n = 206)	80% (n = 302)	76% (n = 187)	81% (n = 151)	.65
21	Injuries, poisonings	68% (n = 188)	67% (n = 239)	72% (n = 342)	65% (n = 265)	70% (n = 149)	.81
23	Factors influencing health status	48% (n = 344)	55% (n = 464)	59% (n = 508)	52% (n = 318)	54% (n = 142)	.98
---	All included MDCs	64% (n = 14,385)	65% (n = 22,399)	65% (n = 28,520)	63% (n = 20,802)	66% (n = 12,828)	.25
				Total Discharges = 98,934			

Note: MDC = major diagnostic category. Cell totals represent the total number of discharges specific to the row's MDC and column's discharge date category. Table 1 excludes MDCs for which there were fewer than 200 inpatient discharges in the pre-merger (i.e., four or more months before merger) or post-merger (i.e., four or more months after merger) time periods. MDCs that are statistically significant ($p < .0008$) are highlighted in yellow.

[a] Significance value for Pearson's Chi-square test of independence. Null hypothesis states that bypass rate for discharges that took place four or more months pre-merger equals bypass rate for discharges that took place four or more months post-merger.

Table 2 shows the percent of discharges classified as bypass, stratified by diagnosis related group (DRG) and discharge date relative to the merger date of the patient's closest hospital. Results from Pearson's Chi-square test of independence show no significant changes in bypass rates when discharges are stratified by DRG.

Table 2. Percent Bypass by Diagnosis-Related Group and Discharge Date Relative to Merger

		← Months Before or After Merger →					
MDC	**Description**	-15 to -10 (n = 4,531)	-9 to -4 (n = 7,237)	-3 to 3 (n = 9,215)	4 to 9 (n = 6,989)	10 to 15 (n = 4,442)	p[a]
194	Simple pneumonia and pleurisy with CC	51% (n = 206)	46% (n = 307)	44% (n = 402)	40% (n = 300)	37% (n = 152)	.01
392	Esophagitis, gastroenteritis, and miscellaneous digestive disorders without MCC	51% (n = 256)	48% (n = 463)	52% (n = 496)	47% (n = 349)	45% (n = 195)	.35
470	Major joint replacement or reattachment of lower extremity without MCC	74% (n = 594)	76% (n = 1,021)	78% (n = 1,344)	75% (n = 994)	78% (n = 742)	.41
603	Cellulitis without MCC	40% (n = 168)	46% (n = 345)	42% (n = 423)	46% (n = 272)	46% (n = 191)	.68
766	Cesarean section without CC/MCC	64% (n = 333)	65% (n = 435)	64% (n = 545)	64% (n = 435)	69% (n = 248)	.73
775	Vaginal delivery without complicating diagnoses	63% (n = 866)	59% (n = 1,343)	60% (n = 1,665)	59% (n = 1,285)	62% (n = 852)	.89
794	Neonate with other significant problems	62% (n = 297)	67% (n = 525)	64% (n = 713)	61% (n = 579)	61% (n = 360)	.04
795	Normal newborn	63% (n = 1,153)	60% (n = 1,723)	63% (n = 2,133)	62% (n = 1,659)	65% (n = 1,005)	.10
871	Septicemia or severe sepsis without MV 96+ hours with MCC	48% (n = 323)	58% (n = 508)	56% (n = 683)	56% (n = 539)	54% (n = 352)	.77
885	Psychoses	90% (n = 335)	92% (n = 567)	90% (n = 811)	87% (n = 577)	88% (n = 345)	.003
---	All included MDCs	63% (n = 4,531)	63% (n = 7,237)	64% (n = 9,215)	63% (n = 6,989)	65% (n = 4,442)	.77
				Total Discharges = 32,414			

Note: DRG = diagnosis-related group; MCC = major complication or comorbidity; MV = mechanical ventilation; CC = complication or comorbidity. Cell totals represent the total number of discharges specific to the row's DRG and column's discharge date category.

[a] Significance value for Pearson's Chi-square test of independence. Null hypothesis states that bypass rate for discharges that took place four or more months pre-merger equals bypass rate for discharges that took place four or more months post-merger.

SENSITIVITY ANALYSIS

The hospitals in our data have different merger completion dates. Furthermore, given that our HCUP data is restricted to the years 2014-2016, some hospitals in our data only contributed discharges for specific time periods (e.g., if a hospital completed a merger in July 2014, this hospital would not have any discharges in our data that classified as 15-10 months pre-merger). In our initial analysis, four of the 15 hospitals in our sample did not contribute any discharges to the 15-10 months pre-merger time period, and one of the 15 hospitals did not contribute any discharges to the 10-15 months post-merger time period. Thus, to examine the possibility of hospital selection bias, we completed a sensitivity analysis that restricted our sample to the 11 hospitals that contributed discharges for all time periods in our study.

Tables 3 and 4 contain the results of the sensitivity analysis. Table 3 shows the percent of discharges classified as bypass, stratified by MDC and discharge date relative to the merger date of a patient's closest hospital. As with Table 1, Table 3 shows that bypass rates in the 15 months pre-merger were generally not statistically different from the bypass rates in the 15 months post-merger. Table 3 also shows that the bypass rate for discharges corresponding to MDC 4 (respiratory system) decreased in the months following a merger. However, unlike Table 1, the decrease in bypass rate for MDC 4 was not statistically significant in Table 3. Furthermore, Table 3 shows that the bypass rate for discharges corresponding to MDC 19 (mental diseases and disorders) significantly decreased in the months following a merger.

Table 3. Percent Bypass by Major Diagnostic Category and Discharge Date Relative to Merger (Subgroup: 11 hospitals that contributed data across all five discharge date categories)

		← Months Before or After Merger →					
MDC	**Description**	-15 to -10 (n = 14,385)	-9 to -4 (n = 17,633)	-3 to 3 (n = 19,363)	4 to 9 (n = 16,176)	10 to 15 (n = 9,654)	*p*[a]
1	Nervous system	76% (n = 694)	76% (n = 787)	73% (n = 895)	73% (n = 757)	77% (n = 421)	.42
3	Ear, nose, mouth, and throat	64% (n = 121)	68% (n = 144)	68% (n = 161)	75% (n = 113)	78% (n = 72)	.02
4	Respiratory system	51% (n = 1,657)	50% (n = 1,852)	49% (n = 2,108)	47% (n = 1,604)	47% (n = 880)	.01
5	Circulatory system	64% (n = 1,823)	63% (n = 2,169)	64% (n = 2,387)	62% (n = 1,952)	66% (n = 1,148)	.95
6	Digestive system	58% (n = 1,277)	59% (n = 1,599)	60% (n = 1,649)	56% (n = 1,374)	57% (n = 831)	.19
7	Hepatobiliary system and pancreas	59% (n = 384)	62% (n = 498)	57% (n = 524)	55% (n = 435)	60% (n = 273)	.12
8	Musculoskeletal system	81% (n = 1,499)	80% (n = 1,895)	79% (n = 2,122)	81% (n = 1,776)	79% (n = 1,283)	.97
9	Skin, subcutaneous tissue, and breast	53% (n = 303)	55% (n = 422)	46% (n = 411)	50% (n = 346)	52% (n = 221)	.21
10	Endocrine	55% (n = 471)	52% (n = 640)	54% (n = 677)	56% (n = 593)	58% (n = 328)	.13
11	Kidney and urinary tract	63% (n = 638)	61% (n = 733)	57% (n = 812)	62% (n = 654)	55% (n = 362)	.23
13	Female reproductive system	72% (n = 160)	71% (n = 184)	68% (n = 210)	69% (n = 155)	78% (n = 76)	.93
14	Pregnancy, childbirth	63% (n = 1,685)	61% (n = 2,144)	60% (n = 2,334)	60% (n = 2,046)	60% (n = 1,215)	.03
15	Newborns and other neonates	64% (n = 1,661)	61% (n = 2,049)	61% (n = 2,273)	61% (n = 2,008)	61% (n = 1,226)	.14
16	Blood	59% (n = 149)	61% (n = 201)	58% (n = 226)	60% (n = 195)	65% (n = 82)	.73
17	Myeloproliferative diseases	76% (n = 111)	84% (n = 133)	87% (n = 158)	88% (n = 143)	90% (n = 79)	.01
18	Infectious and parasitic diseases	55% (n = 648)	59% (n = 862)	58% (n = 950)	58% (n = 897)	56% (n = 503)	.88
19	Mental diseases and disorders	89% (n = 460)	94% (n = 562)	94% (n = 634)	86% (n = 518)	86% (n = 326)	< .0001
20	Alcohol/drug use	78% (n = 112)	78% (n = 155)	79% (n = 196)	74% (n = 140)	81% (n = 113)	.91
21	Injuries, poisonings	68% (n = 188)	66% (n = 181)	71% (n = 232)	64% (n = 204)	73% (n = 103)	.96
23	Factors influencing health status	48% (n = 344)	53% (n = 423)	54% (n = 404)	46% (n = 266)	50% (n = 112)	.30
---	All included MDCs	64% (n = 14,385)	63% (n = 17,633)	63% (n = 19,363)	62% (n = 16,176)	64% (n = 9,654)	.04
				Total Discharges = 77,211			

Note: MDC = major diagnostic category. Cell totals represent the total number of discharges specific to the row's MDC and column's discharge date category. Table 3 excludes MDCs that did not appear in our original analysis (i.e., MDCs that did not appear in Table 1). MDCs that are statistically significant ($p < .0008$) are highlighted in yellow .

[a] Significance value for Pearson's Chi-square test of independence. Null hypothesis states that bypass rate for discharges that took place four or more months pre-merger equals bypass rate for discharges that took place four or more months post-merger.

Table 4 shows the percent of discharges classified as bypass, stratified by DRG and discharge date relative to the merger date of the patient's closest hospital. Results were generally consistent between the initial analysis (Table 2) and the sensitivity analysis (Table 4). However, DRG 885 (psychoses), which was not statistically significant in the initial analysis, became statistically significant in the sensitivity analysis.

Table 4. Percent Bypass by Diagnosis-Related Group and Discharge Date Relative to Merger (Subgroup: 11 hospitals that contributed data across all five discharge date categories)

		← Months Before or After Merger →					
DRG	**Description**	-15 to -10 (n = 4,531)	-9 to -4 (n = 5,675)	-3 to 3 (n = 6,180)	4 to 9 (n = 5,414)	10 to 15 (n = 3,373)	*p*[a]
194	Simple pneumonia and pleurisy with CC	51% (n = 206)	43% (n = 235)	46% (n = 280)	39% (n = 232)	37% (n = 112)	.02
392	Esophagitis, gastroent and misc. digestive disorders without MCC	51% (n = 256)	48% (n = 357)	52% (n = 314)	49% (n = 251)	42% (n = 138)	.33
470	Major joint replacement or reattachment of lower extremity without MCC	74% (n = 594)	70% (n = 764)	71% (n = 912)	73% (n = 788)	74% (n = 582)	.28
603	Cellulitis without MCC	40% (n = 168)	47% (n = 264)	34% (n = 239)	47% (n = 205)	44% (n = 127)	.67
766	Cesarean section without CC/MCC	64% (n = 333)	63% (n = 357)	63% (n = 380)	62% (n = 358)	67% (n = 207)	.98
775	Vaginal delivery without comp. diag.	63% (n = 866)	57% (n = 1,058)	56% (n = 1,131)	56% (n = 999)	57% (n = 661)	.05
794	Neonate with other sig. prob.	62% (n = 297)	65% (n = 359)	66% (n = 379)	61% (n = 394)	57% (n = 248)	.12
795	Normal newborn	63% (n = 1,153)	58% (n = 1,439)	59% (n = 1,567)	59% (n = 1,353)	60% (n = 799)	.51
871	Septicemia or severe sepsis without MV 96+ hours with MCC	48% (n = 323)	57% (n = 403)	54% (n = 468)	55% (n = 430)	53% (n = 253)	.55
885	Psychoses	90% (n = 335)	95% (n = 439)	95% (n = 510)	85% (n = 404)	83% (n = 246)	< .0001
---	All included DRGs	63% (n = 4,531)	61% (n = 5,675)	62% (n = 6,180)	61% (n = 5,414)	61% (n = 3,373)	.06
		Total Discharges = 25,173					

Note: DRG = diagnosis-related group; MCC = major complication or comorbidity; MV = mechanical ventilation; CC = complication or comorbidity. Cell totals represent the total number of discharges specific to the row's DRG and column's discharge date category. DRGs that are statistically significant ($p < .0008$) are highlighted in yellow.

[a] Significance value for Pearson's Chi-square test of independence. Null hypothesis states that bypass rate for discharges that took place four or more months pre-merger equals bypass rate for discharges that took place four or more months post-merger.

DISCUSSION

Our research yielded generally consistent results on changes in the use of inpatient hospital services offered by acquired rural hospitals following a merger. Overall, evidence suggests that bypass rates do not significantly change in the months following a merger (for most MDCs and DRGs). However, our results also suggest that the bypass rate significantly decreased after a merger for discharges related to the respiratory system or mental diseases and disorders (e.g., psychoses). Based on national inpatient data from HCUPnet,[15] AHRQ's online query system, the significant changes in bypass rates may be partially explained by service profitability. Table 5 lists the average inpatient hospital charges for selected MDCs in the year 2016, in addition to the data included in Table 3.

Table 5 shows that discharges corresponding to MDC 19 (mental diseases and disorders) had relatively low average hospital charges in the year 2016. This result is consistent with previous research by Horwtiz,[16] who categorized psychiatric inpatient visits as "relatively unprofitable." Thus, the significant post-merger decrease in bypass rate for discharges corresponding to MDC 19 may partially be explained by the relative lack of profitability of psychiatric inpatient services. However, it should be noted again that almost all other MDCs did not experience a significant post-merger change in bypass rate, regardless of varying average hospital charges and profitability.[16] Thus, more research is needed to investigate the possible link between service profitability and bypass rate.

Table 5. 2016 National Average Inpatient Hospital Charges for Selected Major Diagnostic Categories[a] and Corresponding Bypass Rates

			← Months Before or After Merger →					
MDC	Description	Average Inpatient Hospital Charge, $	-15 to -10 (n = 14,385)	-9 to -4 (n = 17,633)	-3 to 3 (n = 19,363)	4 to 9 (n = 16,176)	10 to 15 (n = 9,654)	p[b]
15	Newborns and other neonates	18.787	64% (n = 1,661)	61% (n = 2,049)	61% (n = 2,273)	61% (n = 2,008)	61% (n = 1,226)	.14
14	Pregnancy, childbirth	19,075	63% (n = 1,685)	61% (n = 2,144)	60% (n = 2,334)	60% (n = 2,046)	60% (n = 1,215)	.03
20	Alcohol/drug use	22,436	78% (n = 112)	78% (n = 155)	79% (n = 196)	74% (n = 140)	81% (n = 113)	.91
19	Mental diseases and disorders	24,848	89% (n = 460)	94% (n = 562)	94% (n = 634)	86% (n = 518)	86% (n = 326)	< .0001
9	Skin, subcutaneous system, and breast	35,581	53% (n = 303)	55% (n = 422)	46% (n = 411)	50% (n = 346)	52% (n = 221)	.21
10	Endocrine	37,689	55% (n = 471)	52% (n = 640)	54% (n = 677)	56% (n = 593)	58% (n = 328)	.13
23	Factors influencing health status	40,115	48% (n = 344)	53% (n = 423)	54% (n = 404)	46% (n = 266)	50% (n = 112)	.30
11	Kidney and urinary tract	41,258	63% (n = 638)	61% (n = 733)	57% (n = 812)	62% (n = 654)	55% (n = 362)	.23
3	Ear, nose, mouth, and throat	42,605	64% (n = 121)	68% (n = 144)	68% (n = 161)	75% (n = 113)	78% (n = 72)	.02
16	Blood	43,936	59% (n = 149)	61% (n = 201)	58% (n = 226)	60% (n = 195)	65% (n = 82)	.73
13	Female reproductive system	44,992	72% (n = 160)	71% (n = 184)	68% (n = 210)	69% (n = 155)	78% (n = 76)	.93
4	Respiratory system	46,224	51% (n = 1,657)	50% (n = 1,852)	49% (n = 2,108)	47% (n = 1,604)	47% (n = 880)	.01
21	Injuries, poisonings	47,060	68% (n = 188)	66% (n = 181)	71% (n = 232)	64% (n = 204)	73% (n = 103)	.96
6	Digestive system	47,562	58% (n = 1,277)	59% (n = 1,599)	60% (n = 1,649)	56% (n = 1,374)	57% (n = 831)	.19
7	Hepatobiliary system and pancreas	53,492	59% (n = 384)	62% (n = 498)	57% (n = 524)	55% (n = 435)	60% (n = 273)	.12
1	Nervous system	60.874	76% (n = 694)	76% (n = 787)	73% (n = 895)	73% (n = 757)	77% (n = 421)	.42
8	Musculoskeletal system	68,246	81% (n = 1,499)	80% (n = 1,895)	79% (n = 2,122)	81% (n = 1,776)	79% (n = 1,283)	.97
5	Circulatory system	70,910	64% (n = 1,823)	63% (n = 2,169)	64% (n = 2,387)	62% (n = 1,952)	66% (n = 1,148)	.95
18	Infectious and parasitic diseases	72,162	55% (n = 648)	59% (n = 862)	58% (n = 950)	58% (n = 897)	56% (n = 503)	.88
17	Myeloproliferative diseases	101,779	76% (n = 111)	84% (n = 133)	87% (n = 158)	88% (n = 143)	90% (n = 79)	.01
					Total Discharges = 77,211			

Note: MDC = major diagnostic category. Cell totals represent the total number of discharges specific to the row's MDC and column's discharge date category. Table 3 excludes MDCs that did not appear in our original analysis (i.e., MDCs that did not appear in Table 1). MDCs that are statistically significant ($p < .0008$) are highlighted in yellow.

[a]MDCs were selected based on inclusion in Tables 1 and 3.

[b] Significance value for Pearson's Chi-square test of independence. Null hypothesis states that bypass rate for discharges that took place four or more months pre-merger equals bypass rate for discharges that took place four or more months post-merger.

Our research examined changes to inpatient service use in the 15 months before and after a rural hospital merger. Overall, our results suggest that inpatient services are generally maintained at the pre-merger level by the acquiring hospital following a hospital merge. Exceptions include discharges corresponding to the respiratory system and mental diseases and disorders. Future research should continue to examine the possible effect of rural hospital mergers on patient care-seeking behavior over a longer time period. Furthermore, we should consider the potential policy relevance of the statistically non-significant results from our research. As mentioned above, the services considered in our research represent varying levels of profitability.[15, 16] Thus, the fact that we did not observe many consistent effects of mergers on bypass rates may suggest that acquiring hospitals are not "poaching" profitable services from (or delegating unprofitable services to) acquired rural hospitals. Again however, our analysis was based on observations of 15 hospitals over a relatively small time period, so more research is needed to confirm our results.[17] Given the importance of rural health care, it will be important to continue examining the possible effects of mergers and acquisitions on rural hospitals and the surrounding communities.

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This study was supported by the Federal Office of Rural Health Policy (FORHP), Health Resources and Services Administration (HRSA), U.S. Department of Health and Human Services (HHS) under cooperative agreement # U1GRH03714. The information, conclusions and opinions expressed in this brief are those of the authors and no endorsement by FORHP, HRSA, HHS, or The University of North Carolina is intended or should be inferred. Any interpretations, conclusions, and/or opinions reached as a result of analyses of the data sets are those of the authors and do not constitute the findings, policies, or recommendations of the U.S. Government, the U.S. Department of Health and Human Services, or AHRQ.